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(54) Method and apparatus for customer identification at automated teller machines.

(57) In an automated customer interaction device such as an automated teller machine (ATM), a digital camera, under program control, provides a visual record of a transaction by recording the facial image of the client involved in the transaction. The digital visual image is compressed and stored for a preselected period of time. When a question arises with respect to a transaction, the compressed image can be retrieved and reconstructed. The reconstructed image can be used to determine the participant in the questioned activity.

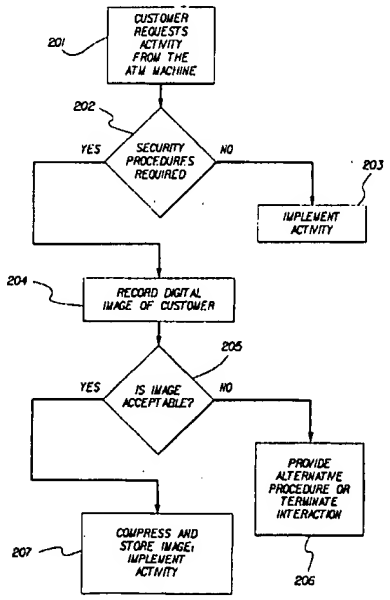

FIG. 2

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Field of Invention

This invention relates generally to the misuse of transaction cards and, more particularly. to the capture and recording of images using transaction cards at automated customer interaction device, e.g., automated teller machines (ATM machines).

Background of the Invention

An increasing number of transactions are being processed by automated customer interaction devices. Typically these devices use a transaction card as a mechanism to access authorized services. Examples of such devices are automated teller machines, automated gasoline dispensing machines, vending machines, and automated retail check out devices. In the following description, the automated teller machines (or ATMs) will be used as an example of the application of the present invention.

ATM's are a popular and convenient means to access personal financial resources, such as checking and savings accounts. In 1992 the number of ATM transactions has been estimated to be 7.2 billion. While the ease of access is a great benefit to the majority of customers, there is a growing amount of fraud associated with this service. Since the transactions do not require direct intervention of bank personnel and transactions occur at any time of day, a method to record an image of the person making the transaction offers a means to counteract the fraud.

The common security device is the use of Personal-Identification-Numbers (PIN). However, as recent events have shown, the heavy reliance on PIN's does not provide a sufficient level of security in the use of the transaction card. The PIN numbers are easily obtained through a myriad of schemes. More aggressive systems are needed in order for the continued acceptance of the ATM as an integral part of personal financial transactions. Any new system will have to require minimal customer intervention, and minimal to no perceived increase in delay for processing. Furthermore, the errors in invalidation of a transaction or potential transaction must be minimized.

Many ATM's come equipped with a camera in order to capture the images of the persons associated with the transactions, but these systems are limited in several aspects. If the camera captures an image by a photographic method, then the camera is limited by the amount of film loaded and by matching transaction with the image. Using a video camera and locally storing a captured image on video tape has a similar problem. Capturing and transmitting images via close-circuit television is quite expensive, and storing and maintaining the image data file becomes a major system constraint.

A need has been felt for capturing an image of the person associated with a transaction and assuring that the image information is gathered, collected and maintained by a system, wherein the system is efficient and cost-effective.

Summary of the Invention

The present invention is directed to overcoming one or more of the problems set forth above. Briefly summarized, according to one aspect of the present invention, an ATM machine has a digital camera associated therewith. When a transaction is requested, the digital camera, under program control, records the visual image of the customer requesting the transaction. The digital visual image can be compressed and stored. When a question arises with respect to the transaction, the digital image can be retrieved and reconstructed and the customer/participant in the transaction identified.

The ATM machine of the present invention advantageously provides that an image of a customer associated with each transaction is maintained. Many disputes can be resolved with the availability of an image of the transaction participant. When a fraudulent transaction is identified, the image of the person involved in the transaction is available for identification. Compression technology has adequate image quality and processing speed to have negligible impact on the customer. Security is improved over a system relying only on the PIN approach.

These and other aspects, objects, features and advantages of the present invention will be more clearly understood and appreciated from a review of the following detailed description of the preferred embodiments and appended claims, and by reference to the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a block diagram of the components associated with the ATM machine.

Figure 2 illustrates the procedure for providing a visual record of a transaction according to the present invention.

Detailed Description of the Invention

The convenience and availability of and potential value available from ATM's make these devices tempting targets for theft and fraud. While it is nearly impossible to forestall all the possible schemes to commit crimes involving these machines, the increase in the likelihood of documenting the thief or generating a record which can improve the resolution of customer claims of being a victim of ATM fraud can provide a important increase in the confidence in these machines.

An ATM is equipped with a telecommunications link to the financial institution in order for a pending

transaction to be processed. Information regarding the account and the type and amount of the transaction are all handled over this digital communications link. The bank keeps current records of the transaction and the status of the customer's accounts through a dynamic financial database.

Much of the security of ATM transaction is accomplished by using a Personal-Identification-Number (PIN). This is typically a multi-digit passcode which is known by the customer and the bank. However, this means of security is quite fragile and is prone to being compromised by many techniques, including customer carelessness. The telecommunications link could be used for other means of security besides the PIN procedure. For example, the link can be used to transmit recorded image between the ATM machine and the financial institution.

In fact, images have long been a means of increasing security in financial institutions. Nearly all banks have a system of surveillance cameras which record activity within the bank. These cameras have been quite useful in the apprehension and conviction of bank thieves. However, this technology is useful because banks have a controlled environment, limited hours of operation, and limited and guarded physical space. Conditions for the operation of ATM's are different than those found in a bank. The number of ATMs is significantly larger than the number of banks, and the ATMs can be placed in locations which make the use of a surveillance camera either impractical or ineffective. Moreover, when a bank theft has occurred there is immediate knowledge of that event having occurred. This is not the case in ATM fraud, where the customer and bank may not be aware that fraud has occurred until after extended period of time. In addition, the location of the fraud may not be immediately determined and recovering the images collected during the transaction of the event present logistical problems.

The problem with all current surveillance systems is that the images are collected in an analog fashion, e.g., by means of video cameras. Since the ATM financial transaction information is stored and processed digitally a problem occurs in maintaining and indexing the analog storage with the digital transaction. Retrieving the desired image from video tape is a tedious, time-consuming and inexact process.

The preferred embodiment of this invention provides for the installation of a digital camera within the ATM. The digital camera records an image of the customer. The image can be compressed, stored either in the ATM itself or at a nearby location The digital camera image can be accessed by the financial institution over the ATM network if desired. A data-base management system can be included as part of the software operating on the ATM being used to manage the collection of images.

By way of example, images captured by a digital camera with an NTSC resolution of 768 x 512 pixels can be compressed at a ratio of 30:1. Such compression ratios can be achieved using one of many possible compression algorithms, algorithms such as those contained in the Joint Photographic Experts Group (JPEG) standard. The compressed image requires approximately 13,000 bytes of data. Application specific integrated circuits (ASIC's) have been developed capable of compressing images at nearly 10 million pixels/second. The preferred size of the image is sufficiently small such that the time required for compression can be considered insignificant in comparison to the average ATM transaction time. The typical ATM processes approximately 7,000 transactions per month. These images are stored locally at the ATM on a disk or tape drive with storage capacity for a sufficiently large number of compressed images. Storage of these images on the ATM minimizes the impact of the digital image archiving on telecommunications by not requiring that the images to be transmitted to a central archive. Normal ATM transactions record and transmit the time, location, and a transaction identification number. If the image information needs to be queried for any purpose, the particular ATM and transaction identifier can be used to access the data. The image information is retrieved from the storage facility associated with the ATM and telecommunicated, in compressed form, to the requesting terminal.

The storage mechanism can be selected after determining the anticipated utilization of the ATM, the size of the image, and the desired length of time an image is to be archived. Clearly, the longer the archival period, the larger the needed capacity of the image storage device. The same requirement for large storage capacity can be inferred by those ATM's having a higher utilization. Many devices are commercially available with enough capacity to provide an archival record of three months of ATM transaction images and still have sufficient capacity to hold the database management system for the image storage.

Once an image has been resident beyond its archival period, one of several actions can be selected. The image may be purged from the system and the archival space reused for other images. The information can be archived off-line for a selected period. The design requirements and storage requirements for active storage should be adequately below capacity in order to prevent an overflow of images in the storage facility.

From the customer's perspective, the ATM will operate just as the current ATM system. Referring to Fig. 1, the ATM device 10 has a customer interface device 19 which responds activity by a customer and which can provide information and materials (e.g., transaction receipt, cash, etc.,) in response to the customer activity. The ATM device 10 includes a still-frame digital camera 11 (substituted for the typical

analog video device) which, under control of the ATM control software 15, records images during an interaction between a transaction card carrier and the ATM machine. The digital image recorded by the digital camera 11 is compressed by image compression procedure 12. The compressed image resulting from compression procedure 12 is stored in the image data 14 under the control of the data-base manager 13. The data-base manager will be catalogued and inserted in the image data-base 14. The ATM control software 15 will conduct the normal financial interactions with the financial institution 17 via a remote access link 16. The data-base manager has the additional responsibility of maintaining the image data-base 14 and purging any images which have resided in the image data-base 14 for beyond the retention period.

If a query is necessary from the financial institution, the query is transmitted to the ATM 10 via a remote access link 16 to the ATM control software 15. The ATM control software 15 accesses the data-base manager to search for the desired catalog information and to retrieve the desired image. The desired image is transferred to the financial institution 17 under the control of the ATM control software 15. At the financial institution 17 the image is decompressed and the reconstructed image is used for its intended purpose. As will be clear, several portions of the ATM machine are, or are associated with data processing capability. The compression facility 12, for example, can be a software program or can be a dedicated microprocessor chip. In either implementation, the compression facility operates under the control of the ATM control software. Similarly, the data-base manager is typically a software program operating under the control of the ATM control software. The image data-base would typically be stored in a hardware apparatus.

Referring to Fig. 2, the procedure for use of the augmented ATM machine according to the present invention is shown. In step 201, the customer implements a log-on procedure in order to request a selected activity, e.g., withdrawal of cash from the machine. In step 202, the ATM control software 15 determines whether the requested activity is such that a transaction recording should be made. Typically at present, the log-on procedure mandates the requisite security arrangements. However, when no security procedures are required, the requested activity is implemented by the system. When the security procedures of the present invention are required, a digital image of the customer is recorded in step 204. In step 205, a determination is made whether the recorded digital image is acceptable. When the digital image is not acceptable, then, an alternative procedure is implemented. The alternative procedure can include attempting to record the image a second time or can be a termination of the interaction of ATM machine with the current customer. In step 207, when the image is determined to be acceptable, then the image is compressed and stored in the ATM machine and the requested activity is implemented.

One concern is the acquisition of an acceptable image. To accomplish this, the customer must be within the imaging plane of the camera. This positioning of the customer can be accomplished by one of several methods, such as a weight activated sensor which does not permit the image to be recorded until a sufficient weight is present. This can be overcome by one knowledgeable of the system and intent on fraud, but this activity is not likely from an actual customer. Moreover, performing the actions necessary to circumvent the system would be likely to draw attention to the perpetrator and reduce the likelihood of the action. However, the actual embodiment of such a mechanism is out of the scope of this invention.

Since the image is captured digitally, many actions could be taken on the image to further reduce the avoidance of having one's image captured. These include but are not limited to: distribution of image values and comparing the result to the distribution of pixels for an image of simply the background; or applying pattern recognition methods to determine whether an object like a person is present in the image. If processed image is not within bounds deemed to be nominal, the transaction is discontinued and the ATM card is returned.

It will be now appreciated that there has been presented apparatus and a technique for reducing the fraud at an ATM device. The technique includes recording a digital image of the customer. The digital image can be compressed and stored in the ATM machine for a predetermined time period. When the transaction is the subject of review, the digital image, which has been stored in the ATM machine, is retrieved and can be transmitted to the central location. Because the image is compressed, the transmission of selected (compressed) images over the communications link does not appreciably add to the traffic. In addition, because the digital images can be compressed, the on-site storage requirements for the accumulated recorded images can be met with commercially available equipment.

While the invention has been described with particular reference to ATM machines, it is apparent that the invention is easily adapted to other automated devices that provide a controlled interaction between a customer or client and the automated device itself. The digitized and compressed visual record of a transaction, permits record storage of transactions which would otherwise not be available. The present invention is intended to augment, not replace, the security procedures (e.g., the use of a PIN number) already established or which will be instituted in the future.

While the invention has been described with particular reference to a preferred embodiment, it will be

understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements of the preferred embodiment without departing from invention. In addition, many modifications may be made to adapt a particular situation and material to a teaching of the invention without departing from the essential teachings of the present invention.

As is evident from the foregoing description, certain aspects of the invention are not limited to the particular details of the examples illustrated, and it is therefore contemplated that other modifications and applications will occur to those skilled in the art. It is accordingly intended that the claims shall cover all such modifications and applications as do not depart from the true spirit and scope of the invention.

Claims

1. An automated customer interaction device comprising:

   a processing facility, said processing facility including control software and a data-base manager;

   a digital camera for recording digital image in response to signals initiated by said control software;

   a compression facility, said compression facility compressing said digital image; and

   a data base system, said data base system including a data base manager and a data base storage, said data base manager operating under control of said control software, said data base manager controlling a storage of said compressed image in said data base storage.

2. The automated customer interaction device of claim 1 further comprising a communication link, said communication link providing signals to said control software to transmit a preselected digital image over said communication link.

3. The automated customer interaction device of claim 1 further including confirmation apparatus for determining that an acceptable digital image has been recorded.

4. The customer interaction device of claim 1 wherein said device is an ATM machine.

5. A method of providing a transaction record in an automated customer interaction device, said method comprising the steps of:

   when a customer is interacting with said automated customer interaction device, recording a digital facial image;

   compressing said digital facial image; and

   using a data-base manager, retrievably storing said digital facial image.

6. The method of claim 5 further including the step of transmitting an identified digital facial image over a communication link in response to signals requesting transmission of the identified digital facial image.

7. The method of claim 5 further including the step of implementing said method in an ATM machine.

8. An automated customer interaction device comprising:

   a processing unit, said processing unit including;

   control software,
   a data base manager,
   a compression facility, and
   a storage unit; and

   a digital camera, said digital camera capturing an image in response to control signals, wherein said image is compressed to provide a compressed image by said compression facility, said compressed image being retrievably stored in said storage unit under control of said control software.

9. The automated customer interaction device of claim 8 wherein each compressed and stored image is associated with an automated customer interaction device transaction.

10. The automated customer interaction device of claim 9 further comprising a communication link, said control software transmitting a preselected stored image over said communication link in response to signals received from said communication link request said preselected stored image.

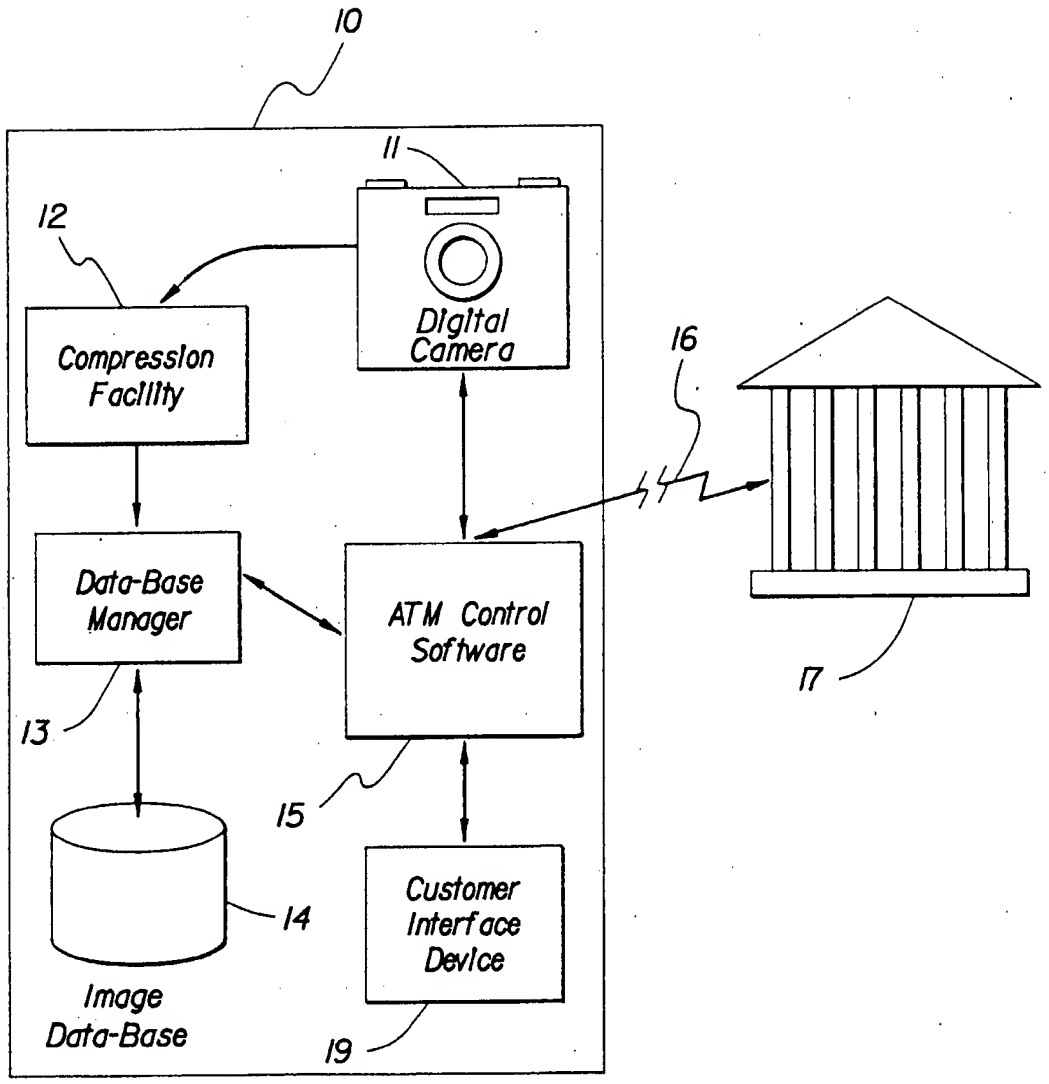
10
11
12
Digital Camera
Compression Facility
16
Data-Base Manager
ATM Control Software
13
17
15
14
Customer Interface Device
Image Data-Base
19

FIG. 1

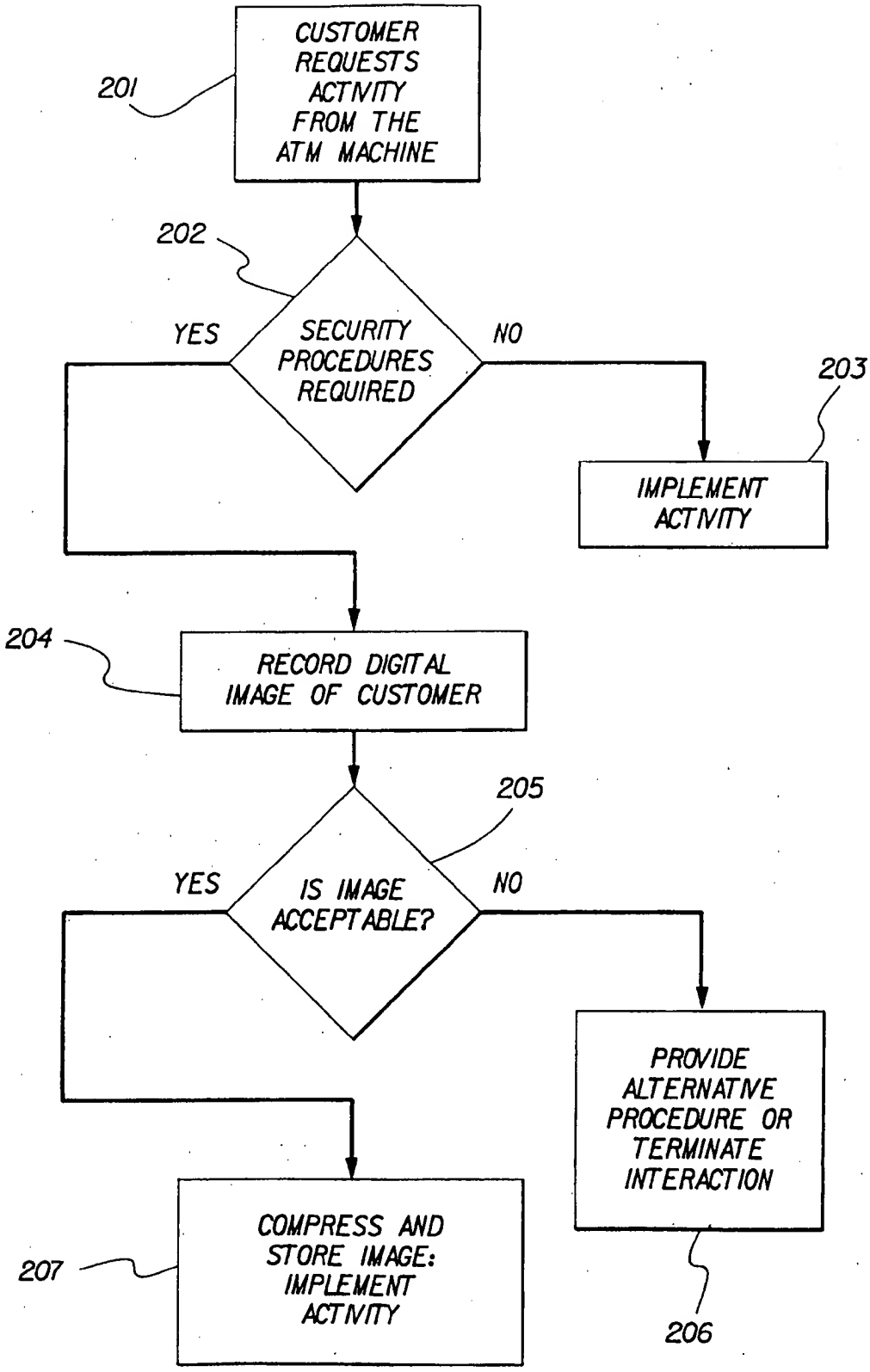
CUSTOMER REQUESTS ACTIVITY FROM THE ATM MACHINE
201
202
SECURITY PROCEDURES REQUIRED
YES
NO
203
IMPLEMENT ACTIVITY
204
RECORD DIGITAL IMAGE OF CUSTOMER
205
IS IMAGE ACCEPTABLE?
YES
NO
PROVIDE ALTERNATIVE PROCEDURE OR TERMINATE INTERACTION
206
COMPRESS AND STORE IMAGE: IMPLEMENT ACTIVITY
207

FIG. 2